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14. ABSTRACT This final technical report deals with the acquisition of the Laboratory Equipment under the grant number F49629-01-1-0562. The Laboratory Equipments have been acquired and the laboratory experiments are being set-up. The report describes the details of the equipment and the courses in which the equipments will be used.					
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Final Report on the

"Laboratory Equipment for Machinery Condition Monitoring and Diagnostics"

Award No: F49620-01-1-0562

**Awarded to: Turabo University, Sistema Universitario Ana G Mendez, Puerto Rico
(Principal Investigator: Dr. Visvanatha Sundararajan)**

Total Grant: \$ 48060.00

Prepared by: Dr. Visvanatha Sundararajan

This report deals with the laboratory equipment acquired under the AFOSR grant cited above. The grant announcement was made on October 15, 01.

The Machinery Fault Simulator Package from the SpectraQuest, Richmond, Virginia, which is the major equipment, arrived on May 5, 02. Turabo University has allotted space to set up the laboratory in SNL 151. While we were testing the equipment and the software SpectraQuest informed that the National Instruments Dynamic Signal Acquisition Board NI-4452 might exhibit channel swapping or voltage offset on the input signal and the National Instruments wants to upgrade the software to eliminate this problem. The CPU containing the NI-4472 card was shipped to SpectraQuest in October. We received the CPU back with a new NI-4452 installed on January 10, 2003. Rest of the equipment arrived during March and April 2002.

The principal investigator, Dr. V. Sundararajan, attended a 4-day hands-on course from 4th to 7th June, 2002 given by the SpectraQuest at Richmond, Virginia. The objective of the course is to develop a basic understanding of how to configure the SpectraQuest Machinery Fault Simulator (MFS). The course, which was performed in a classroom setting, included:

- (1) Instrumentation and wiring of the MFS to collect appropriate data
- (2) Configuring the MFS for various studies like misalignment, unbalance, rolling element and sleeve bearing faults and gearing defects
- (3) Data collection and the display of waveforms and spectra using the SpectraQuest software.

The course was very instructive and will be of great help in using the SpectraQuest equipment here.

The impulse force hammer will be used for experimental modal analysis.

The Machinery Fault Simulator provides a hands-on tool for teaching topics like resonance, critical speed, bearing faults, gear faults and for controlled experiments in rotor dynamics. In the laboratory instructional environment the learning can be very high if the experiment are challenging, design oriented, less structured and more open-ended.

Having this in view, presently laboratory experiments are being set-up.

The equipments will be used in the following courses:

1. MEEN 427 Mechanical Engineering Systems Laboratory
2. MEEN 464 Mechanical Vibration

The equipments will also be used for undergraduate research. One area of research will be to detect cracks and other damages using vibration response. We are planning to involve at least two undergraduate students per year in research. Two advanced elective courses are proposed so that the students will be able to undertake research.

The list of equipments and the associated costs are as follows:

Perm Tag No	Asset Description	Vendor name	Amount
41954	Machinery Fault Simulator Unit	SpectraQuest	38951.84
41852	CPU with National Instrument data Acquisition card	SpectraQuest	
41404	Impulse Force Hammer and accessories	Kistler instrument Corporation	1018.87
42076 to 42081	Laboratory benches and stools	Global Equipment	3185.80
42084	BK Precision model 2522B-20 MHz Digital storage/Analog Oscilloscope	Allied electronics	1231.18
42085	BK Precision 4011a-5 MHz Function Generator (with freight charges)	Allied Electronics	413.32
	AC Power Source and Battery Charger	PCB Piezotronics	335.00
42082,40636, 41402	IBM Net Vista, IBM Monitor, 64 MB graphic card and HP scanjet 4400	Tele Pro Caribe Inc	1983.99
	Laboratory supplies	Sears	133.98
	BNC connectors and Cables	Radio Shack	99.81
----	Travel of Principal Investigator to SpectraQuest, Richmond, Virginia		827.55
			<u>48181.34 *</u>

The Principal Investigator is very grateful to the AFOSR for making the funds available to acquire the above equipments. The laboratory instruction using these equipments will greatly enhance the education of our students in the mechanical design area.

*The Turabo University will pay the excess amount of \$ 121.34.